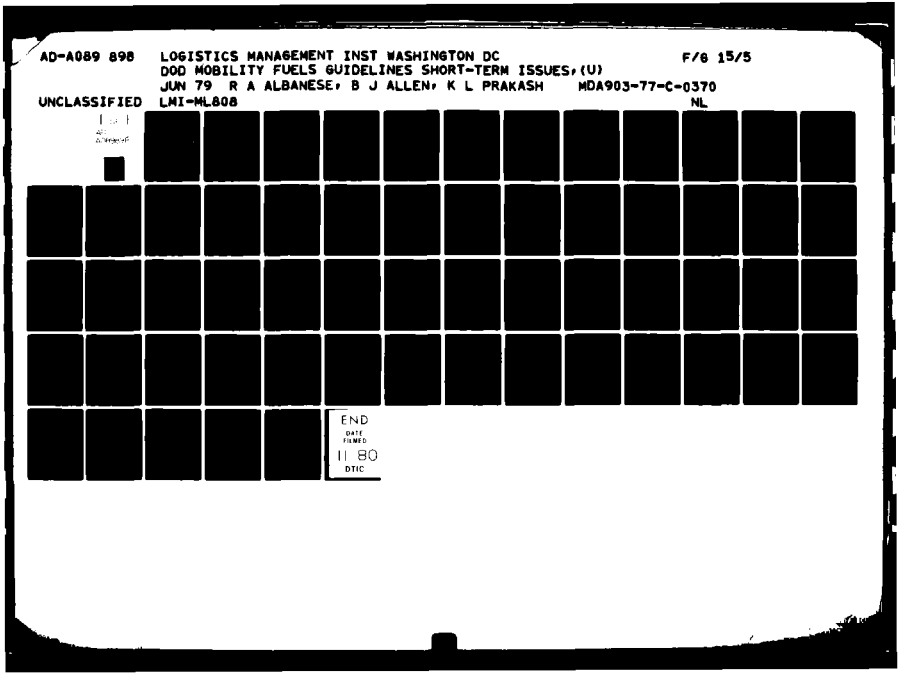
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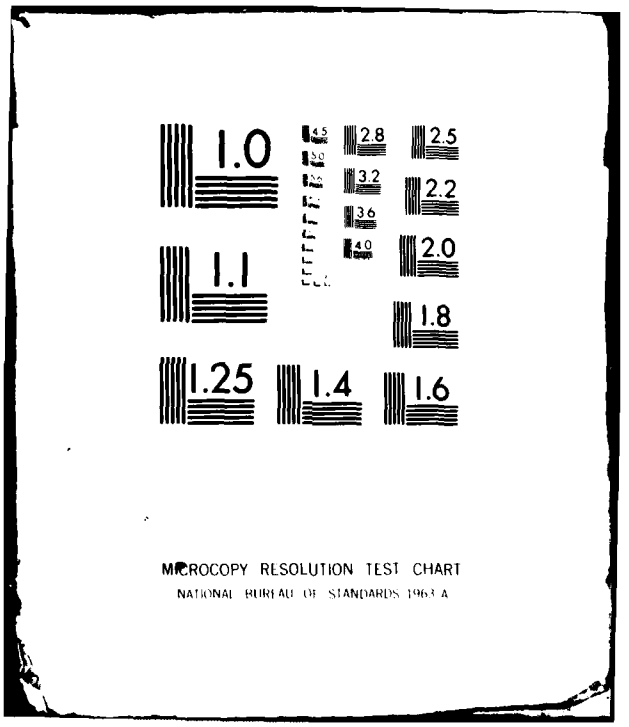
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DOD MOBILITY FUELS GUIDELINES
SHORT-TERM ISSUES

MDA903-77-C-0370

June 1979

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EXECUTIVE SUMMARY

In the coming months and years the United States is faced with a potential oil crisis that could cause adverse effects equal to, or greater than those suffered as a result of the 1973 Arab oil embargo. This potential crisis has severe implications for United States military readiness and the availability of mobility fuels for DoD use.

LMI's analysis addresses the current situation with respect to the availability of mobility fuels. Recommended guidelines and policies are presented that should lessen the barriers impeding fuel availability to DoD during peace time conditions where no military crisis exists.

This review was concentrated on current DoD mobility fuel issues and strategies are recommended that can be implemented immediately and are geared towards alleviating short-term problems. A companion review has considered mid- to long-term fuel supply issues particularly with regard to examining the eventual transition to synthetic liquid hydrocarbons.

There are a number of issues that relate to the impaired ability of DoD to secure adequate supplies of mobility fuels. These issues include changes in market conditions, lack of flexibility in procurement practices, the continued uncertainty over legislative and regulatory issues, and decontrol of JP-4 and JP-5 jet fuels. In part, because of these changes, there has been a pronounced shift of sources of supplies of mobility fuels from the major oil refiners to small independent refiners which in some cases, has reduced logistics flexibility and made DoD more vulnerable to short-term supply disruptions.

We have identified four areas in which DoD can take actions which should ease the problems. These four areas are

- Modification of current fuel procurement procedures
- DoD policy with respect to the stockpiling of fuels
- Maintenance and use of the preferential legislative and regulatory action available to DoD and DOE to ensure supplies, and
- The forecasting and planning process for fuels within DoD.

The recommendations in the report are grouped under these headings.

PROCUREMENT PROCEDURES

The Defense Fuels Supply Center has had problems recently in procuring all fuels. For example, significant procurement difficulties exist for JP-4, the naphtha-based jet fuel which accounts for roughly 63 percent of the total DoD energy consumption. These difficulties stem in part from an increasing reluctance on the part of major oil refiners to continue to supply JP-4 to DoD. The reasons for this reluctance include:

- a lack of the refining capacity needed to produce all of the refined petroleum products currently demanded especially unleaded gasoline. This is especially important because the JP-4 naphtha feedstock is also the feedstock needed for unleaded gasoline
- a desire to protect the heavy capital investment tied up in gasoline reforming equipment, distribution, and retailing, and to protect the extensive network of wholesalers, jobbers, and retailers
- the desire to maintain the higher profit margins available from making gasoline rather than JP-4
- a perception that there are unnecessary delays and relative inflexibility in contracting with the government

Because of the decline in major refiner participation, an increasing percentage of JP-4 is being supplied by small, independent refiners who have extremely simple equipment. The simplicity of the equipment prohibits their refining gasoline but makes it possible for them to produce JP-4. However, future supplies from these small refiners will depend upon their ability to

obtain commitments from crude suppliers (normally the major oil companies) and their continued receipt of the small refiner bias.

We believe that short-term procurement problems can be minimized by improving the competitive market environment with suppliers. This can best be accomplished by learning how procurement practices need to be changed in light of changing market conditions. We believe that consideration should be given to

- determining if current pricing policies, bidding procedures, and the length of contracts need improvement given changing market conditions.
- examining the prospects for attracting reliable suppliers from outside the United States, in particular European refiners who currently have unused capacity.
- investigating the reasons behind the exodus of major refiners from the military jet fuels market in order to develop strategies for increasing major refiner participation.
- investigating possible spot market purchases of military fuels during those times when it would be advantageous to do so.

STOCKPILING ISSUES

Stockpiling can be an effective means of minimizing the effects of an embargo or short-term supply/demand imbalances. There are three means available presently for stockpiling. These are DoD's own stockpile; use of the Strategic Petroleum Reserves; and the use of the Naval Petroleum Reserves. We believe that the potential for each of these stockpiles to minimize impacts of energy shortfalls is great but that there are a number of issues that must be clarified before DoD can rely upon them as a means of safeguard.

We believe the following action should be taken to provide the necessary stockpiling for energy emergencies:

- proceed with procedures for gaining jurisdiction over the NPR as a *de facto* stockpile of crude
- investigate earmarking production from the NPR for DoD use during energy emergencies

- attempt to increase the inventory capacity at those posts, camps, and stations hurt most by oil supply disruptions

- work with DOE in the SPR drawdown plan to ensure the inclusion of special provisions for DoD suppliers when the national defense posture is at risk

- increase inventory levels of JP-4 and JP-5 as a hedge against procurement difficulties

LEGISLATIVE/REGULATORY ISSUES

Legislative and regulatory issues will have a significant impact upon current as well as the future availability of mobility fuels. Congress will have to act on a number of controversial issues in the next two years. These will include proposals on gasoline decontrol, decontrol of crude oil prices, oil-related taxes, horizontal divestiture, pipeline divestiture, lockup of federal lands, and production incentives for fossil and alternative fuels. In addition, there are many regulatory issues that either have not been finalized or need clarification with respect to their application during energy emergencies.

We believe that DoD can best deal with legislative/regulatory issues by taking the following action:

- DoD should take a position in support of the decontrol of gasoline

- develop a DoD staff function at the appropriate level to survey proposed energy legislation and regulations affecting DoD and prepare official DoD position statements

- work with DOE to develop the necessary regulations for applying the Defense Production Act and the Emergency Petroleum Allocation Act to petroleum products

- support proposed DOE legislation for enhancing oil shale technologies. Lobby for a DoD set-aside written into the bill for R&D efforts

PLANNING

We believe that there are at least three short-term planning initiatives that could be undertaken which would help direct the management of future mobility fuel supplies and minimize the risks of supply disruptions.

First, DoD should develop an Integrated Energy Plan which would detail separate energy strategies for both fixed facilities and mobility fuel requirements. This plan would incorporate the requirements and forecasts for each military service and serve as a reference point in establishing progress for meeting energy goals.

Second, DoD should develop an Integrated Research and Development Plan. This plan would help establish the research and development effort that must span 20 to 30 years, and the transition from natural crudes to synthetic crudes from oil shale or coal liquids and eventually to non-petroleum derived fuels.

Third, DoD should work closely with DOE to develop strategies for the commercialization of oil shale and coal liquefication. Because of the need for additional R&D, oil shale and coal liquids do not presently have commercialization status. DoD can use its unique position to help DOE devleop strategies which will enhance the development of these future technologies.

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I. INTRODUCTION

The United States is currently faced with an impending oil crisis that could equal if not exceed the adverse economic effects of the 1973-74 Arab Oil Embargo. These are the sentiments of Energy Secretary Schlesinger, who recently announced the approval of standby plans for gasoline rationing and reimposition of mandatory allocations for petroleum products. This situation has profound implications for U.S. military readiness and the availability of mobility fuels for DoD use.

LMI has been tasked with recommending guidelines and policies that would lessen the barrier to fuel availability. This report describes near-term issues facing DoD that may adversely affect the continued supply of military mobility fuels, specifically jet fuels, now or in the future. It also outlines strategies that DoD can take to ensure an uninterrupted supply of fuels. A companion report considers the mid- to long-term situation and the eventual transition from natural liquid hydrocarbons to synthetic liquid hydrocarbons.

It is assumed throughout that DoD will have almost unlimited access to mobility fuels during a limited or general war. What we cannot assume is that DoD will have no procurement problems during a peacetime energy emergency. The readiness of some domestic military installations was greatly impaired during the 1973-74 embargo while fuel distribution and allocation mechanisms were in disarray. The aim of this report is to outline steps that DoD can take now to ensure that another such interruption in supplies will not take place.

The body of the report describes in detail the major issues affecting the supply of military fuels. Chapter II explains the issues surrounding the

procurement of jet fuels JP-4 and JP-5 and the proposed conversion to JP-8 by the Air Force. Chapter III discusses stockpiling issues and outlines alternatives to the Strategic Petroleum Reserve (SPR) and the Naval Petroleum Reserves (NPR). Chapter IV describes legislative and regulatory issues affecting the availability of mobility fuels and isolates the areas where DoD can contribute to the shaping of U.S. energy policy. Chapter V describes ways DoD can make energy a more cohesive Service-wide concern.

There are two appendices containing: an evaluation of DoD strategies for short-term issues (Appendix A); and a discussion of factors influencing refinery investment decisions (Appendix B).

II. PROCUREMENT ISSUES

BACKGROUND

Jet aircraft in the U.S. military services are currently powered by two major types of fuel: JP-4 and JP-5.

JP-4 is a naphtha-based jet fuel first introduced in 1951. Today DoD uses over 95 million barrels per year of JP-4. The Air Force alone consumed over 88 million barrels in fiscal 1978, which represented roughly 63 percent of total DoD energy consumption. Projections of DoD energy consumption show no substantial change in total demand for JP-4 through the year 2000. Because of the nature of research and development for engines and equipment and the time required to phase out old systems and bring new ones on stream, it seems likely that a major portion of our military aircraft will continue to consume JP-4 or a similar liquid hydrocarbon fuel well into the next century.

JP-5 is a kerosene-based jet fuel used primarily by the Navy for aircraft carrier operations. Twenty-three million barrels of JP-5 were consumed in 1977, making it the second most used military jet fuel.

JP-4 differs from JP-5 and commercial jet fuel (another kerosene-based fuel also known as Jet A) in a number of ways. JP-4's flash point is significantly lower, its volatility considerably greater, and its flammability range much lower than the kerosene-based fuels. Thus, JP-4 can be regarded as more hazardous than Jet A or JP-5. In fact, a number of aircraft refuelers and bulk tanks have been destroyed or damaged in recent years due to accidents which involved JP-4. JP-4 has also been blamed for some aircraft losses during the Vietnam War.

JP-8 is another kerosene-based fuel quite similiar to Jet A and considered by many to be safer than JP-4. It has been argued that many of the accidents attributed to JP-4 would not have happened if JP-8 had been used. Both because of safety and its commitment to convert all its aircraft in NATO countries to JP-8 by 1981, the Air Force is considering converting its CONUS units to JP-8 as well. These units account for approximately two-thirds of all Air Force jet fuel consumption, and increased pressure for their conversion to JP-8 is expected after the conversion in Europe is completed.

The following sections explain the issues surrounding procurement of JP-4 and JP-5 and the probably impact of an Air Force conversion to JP-8 in the early 1980s.

JP-4 PROCUREMENT

Prior to the Arab Oil Embargo of 1973, the DFSC had no difficulty in procuring JP-4. Coverage from publicly advertised bids during this period typically ranged from 150 to 200 percent and above. Responses to the Invitations For Bids (IFBs), which contained the amount of fuel the respondent was willing to supply and the asking price, were non-negotiable. That is, the respondent could not adjust the price or the coverage once offered.

After the Oil Embargo, those suppliers who had supplied the DFSC with "controlled" petroleum products during calendar year 1972 were obligated to continue doing so under the authority of the Emergency Petroleum Allocation Act (EPAA) of 1973. Since the amount supplied under this act was to equal requirements, the DFSC experienced JP-4 coverage of 100 percent while this provision was in effect.

JP-4 was decontrolled on October 1, 1976. Since then JP-4 coverage has been solicited through Requests for Proposals (RFPs). The two main differences between RFPs and the pre-embargo IFBs are:

(1) RFPs are responded to with sealed bids rather than public bids.

(2) The sealed bids are subject to negotiations; whereas IFBs contain fixed quantities and prices.

Since the decontrol of JP-4, the DFSC has received sealed bids amounting to total coverage of only 103 to 108 percent. Given current bidding practices, the DFSC believes a minimum of 120 percent is needed for adequate coverage. It has already become evident to DFSC analysts that the next bidding period will not realize even 100 percent of requirements.

The change in contracting procedures reflects increased uncertainty in the petroleum industry. Many suppliers are exercising the option of readjusting the amount of fuel they originally thought they could supply. They are reluctant to be bound by a fixed quantity and price in a market that has recently been subject to both a trade embargo and a drastic price increase. Because of the market uncertainty and the growing dependence of U.S. refiners on inherently unstable foreign crude supplies, the use of RFPs is likely to continue.

Two trends have developed with regard to the procurement of JP-4. One, major refiners have become increasingly reluctant to continue supplying JP-4 to the government, and a number of them, including Texaco, Union Oil, and Shell, have completely withdrawn. Two, because of the withdrawal of the majors, small independent refiners (without their own crude sources) are supplying an ever-increasing percentage of JP-4 requirements. Proposed changes to reduce the small refiner bias[1] could drastically alter this

[1] An explanation of the small refiner bias is provided in Appendix B, p. 3.

situation by forcing a number of current JP-4 suppliers out of business, thus creating a very difficult short-term supply problem. These trends are examined in more detail below.

Major Refiners' Reluctance to Supply JP-4

JP-4 has historically been a cheap fuel that was derived from the naphtha portion of the crude barrel, which was not in much demand. In recent years, naphtha has been in progressively greater demand for the production of solvents and petrochemicals. At the same time, the yield of naphtha per barrel of crude has been decreasing because of the growing demand for both premium gasoline on the light end of the barrel, and, recently, unleaded gasoline from the next heaviest end.

As a result of this product competition, the amount of naphtha available for jet fuel use has been greatly diminished. In addition, the major refineries have a greater stake in protecting their capital assets tied up in gasoline refinery and marketing, and in maintaining a competitive advantage. Hence JP-4 supplies suffer during gasoline shortages, crude shortages, or refining capacity shortages. The recent passage of the gasoline tilt regulations may further aggravate the situation. These regulations provide a greater incentive for gasoline production by allowing refiners to allocate a larger proportion of the crude costs to gasoline, and to recover the adjusted costs by increasing the consumer price. The gasoline tilt regulations are explained more fully in Chapter IV.

Another reason for major refiners's reluctance to supply JP-4 is the amount of red tape that is necessary, both before contract terms are agreed upon and later to recover increased costs during the life of a contract. Because all JP-4 contracts are negotiated, there must be agreement on each point covered, for example, the quantity to be supplied, a going-in price, and

an appropriate escalator to adjust the price automatically during the life of the contract.

Major suppliers complain that the government is relatively inflexible with regards to contract terms. Commercial consumers, more interested in maintaining good relations with their suppliers, are able to pay more for products immediately when there is an unexpected increase in refiner or producer costs. On the other hand, considerable red tape, renegotiation, and quite possibly court proceedings may be required to recover increased costs from the government. Government contract officials have to analyze the request for a price increase by studying both the market and the suppliers' cost accounts. This can be a lengthly process and may involve items that the supplier would not ordinarily disclose to the public. Consequently, suppliers find it difficult to recover added costs even when they are justified and so hesitate to continue doing business with the Government.

Entrance of Small Refiners Into JP-4 Market

The EPAA provided guidelines for ensuring that no domestic refiner would be cut off from its supply of crude. This was accomplished through mandatory allocations, price regulations, and entitlements.

Mandatory allocations allowed those refiners with no control over their crude sources to continue being supplied in an amount not less than the amount sold or marketed to them during the 1972 base period. The guidelines and provisions are spelled out in Section 4 of the EPAA.

Price regulations resulted in different ceiling prices for different classifications of crude. This was an attempt to:

(1) protect domestic refiners from a sudden increase in domestic crude prices

(2) allow higher prices as an incentive for production from new wells and enhanced recovery from old wells

(3) allow a dollar-for-dollar pass-through for net increases in the cost of crude oil

(4) protect end-consumers from drastic petroleum product price increases that might normally result in an uncontrolled market if domestic prices were allowed to rise to world price levels

The Energy Policy and Conservation Act of 1975 (EPCA) amended the EPAA and prescribed guidelines for deriving the price allowed for crude. It also indicated that one of the chief objectives was to obtain optimum production of crude oil in the United States.

Entitlements allowed independent refiners to receive compensation for the increase in crude costs resulting from the OPEC actions. Specifically, entitlements permitted domestic refiners of foreign oil to share the economic benefits associated with access to price-controlled domestic crude oil. These entitlements were designed such that independent refiners would not be forced out of the market by increased costs that could not be recovered by passing them on to consumers.

In addition to entitlements, small refiners (independents with capacity of 175 thousand barrels per day or less) were allowed additional benefits ranging up to a maximum of $1.85 per barrel. This small refiner bias was intended to offset the advantages of economies of scale enjoyed by large refiners.[2] The effect of the EPAA and the EPCA (in conjunction with a shortage of refining capacity) on the industry has been the proliferation of many small refiners, some of which would not be cost-efficient without entitlements and the small refiner bias. The extent of their inefficiency has not been established but may be known in the near future when the impact of the small refiner bias amendment is felt.

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[2]It should be noted here that DOE has proposed changes to the small refiner bias that would, among other things, halve the small refiner bias to a maximum of $.96 per barrel, for the smallest refineries.

Many small refiners have extremely simple equipment, often consisting of only a crude distillation tower and storage tanks. The limited equipment prohibits refining gasoline and JP-5 but is sufficient for JP-4, a relatively simple product. Because of both this fact and generous small business set-aside programs for JP-4 (40 percent of requirements), the DFSC has witnessed a dramatic increase in the number of small refiners supplying JP-4.

JP-5 PROCUREMENT

JP-5 was under mandatory allocations until decontrol of kerojet fuels became effective on Feb. 25, 1979. In this section, we discuss the structure of the kerojet market and refinery capacities and assess the impact of decontrol on future procurements of JP-5.

Market Structure

Large integrated refiners are the major suppliers of kerojet fuel. In 1975, they accounted for about 92.5 percent of kerojet fuel sales, large independent refiners for about 3.5 percent, and small refiners for 4 percent.

The capital demands for specific refining and production equipment have tended to restrict entrance of independent refiners into the kerojet market. Several additional processes are required to produce an aviation-quality jet fuel. These include desulfurization to a maximum weight of 0.3 percent, reduction of the aromatic content to 20-25 percent, caustic washing to reduce lead sulphates, and final cleansing in water wash and clay towers.

Because small independent refiners cannot compete in the JP-5 market as easily as in the JP-4 market, DoD will have to depend more upon the majors. The recent decontrol of kerojet could lead to a reluctance on the part of major refiners to continue supplying DoD with JP-5 for the same reasons as

were mentioned above in relation to the JP-4 procurement. In addition, JP-5 will have to compete with two other products for which demand is expected to increase in the near future, commercial jet fuel and diesel motor fuels.

Commercial airlines are the primary users of kerojet fuel. In 1977, the airlines accounted for 86 percent of kerojet fuel demand as evidenced in the following table:

TABLE II-1. USERS OF KEROJET (1977)

	Thousands of Barrels	Thousands of Barrels Per Day	Percent of Total
Airlines	256,948	679.3	86.0
General Aviation	16,424	45.0	5.5
Aviation Factories	2,113	3.1	.7
Military	16,324	45.0	5.5
Non-Aviation Use	7,324	20.1	2.3
Total	299,441	793.1	100.0

Source: DOE

The airlines will continue to be the dominant users of kerojet. The demand for commercial jet fuel (Jet A and Jet A-1) is expected to increase at an average annual rate of about 3.5 percent over the next four years. Consumption is expected to increase from about 680,000 barrels per day in 1978 to about 775,000 barrels per day in 1982. In addition, legislation to further deregulate airlines, which became effective in Oct. 1978, could accelerate kerojet fuel demand as new routes are activated.

Furthermore, there will be additional product competition from diesel fuels as engine and automotive manufacturers move to produce more diesel engines for cars and trucks. Although it is difficult at present to forecast how much demand for diesel fuel will increase, some engine manufacturers, such as General Motors, have indicated that up to 25% of their new

cars in 1985 will be equipped with diesel engines. Even if this estimate is somewhat optimistic, it is clear that increased demand for diesel fuel could again place pressures upon the manufacture of JP-5.

Refinery Capacity

An analysis of petroleum supplies (Table II-2) shows that total average annual petroleum product demand for 1980 cannot be met without increased domestic refining capacity or increased capacity utilization and will result in increased imports. Domestic refinery capacity is projected to increase by over 1,700 MB/D from 1977 to 1980, while the increase in total petroleum demand is projected to be about 2,400 MB/D. The supply balance presented in Table II-2 assumes refinery capacity utilization in 1979 and 1980 of 90.0 percent (based on crude oil inputs only). At this utilization rate, imports will have to increase by about 900 MB/D in 1980 above the 1977 level.

Continued operation of domestic capacity at the assumed rate of 90.0 percent for 1979 and 1980 with no change in the kerojet yield would satisfy almost all of the projected kerojet demand, with the balance satisfied by imports (Table II-3). Thus, there should be no significant increased in imports of kerojet fuel from current levels, but if refinery capacity does not expand rapidly enough to meet increased demand for the products which will be competing with JP-5, future procurements of the fuel in a decontrolled environment may face the same difficulties as JP-4 procurements.

PROPOSED CONVERSION TO JP-8

In 1976 the NATO allies agreed to use JP-8 for all commonly based NATO aircraft in Europe. The U.S. Air Force is proceeding to convert its aircraft in the United Kingdom from JP-4 to JP-8, and the conversion is expected to be completed by May 1979. Subject to the way this conversion occurs, it has been proposed that other USAF units in Europe will convert to JP-8 between 1980 and 1981.

TABLE II-2. ANALYSIS OF U.S. PETROLEUM SUPPLY
(MB/D)

	1977	1978[a]	1979	1980
Refinery Capacity[b]	16,388	17,200	17,700	18,100
Percent Utilization[c]	89.1%	88.0%	90.0%	90.0%
Anticipated Utilization	14,608	15,100	15,900	16,300
Product Imports	2,176	2,000	2,500	3,100
Natural Gas Liquids	1,618	1,600	1,500	1,500
Other[d]	275	200	200	200
Total Supply	18,677	18,900	20,100	21,100

NOTE: Numbers may not sum to totals because of rounding. Percentages based on unrounded numbers.

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[a]Preliminary actual.

[b]DOE's "Trends and Refinery Capacity and Utilization," September 1978. Estimates do not include Puerto Rico and Virgin Islands, which contribute approximately 1 million barrels per day additional capacity but whose product shipments to the U.S. are considered as imports.

[c]Based on crude imports only.

[d]Includes processing gain, other hydrocarbon inputs, stock change and unaccounted-for crude oil.

SOURCE: DOE

TABLE II-3. PROJECTED KEROJET PRODUCTION AND SUPPLY, 1977-1980
(MB/D)

	1977	1978	1979	1980
Projected U.S. Refinery Capacity	16,755	17,200	17,700	18,100
Projected Utilization	89.1%	88.0%	90.0%	90.0%
Estimated Domestic Refinery Production	14,608	15,100	15,900	16,300
Kerojet Fuel Yield	5.4%	5.4%	5.4%	5.4%
Estimated Domestic Kerojet Fuel Production	782	815	859	880
Kerojet Fuel Imports	+ 50	+ 38	+ 24	+ 38
Total Supply	832	853	883	918

NOTE: Total may not add due to rounding. Percentages based on unrounded numbers.

SOURCE: DOE

Also under discussion is the possible conversion of CONUS units, which use approximately two-thirds of all Air Force jet fuel, to JP-8 following the European conversion. Although this matter is not now being debated extensively, we anticipate that there will be increased pressure for a conversion to JP-8 in CONUS by 1980 or 1981.

The following factors are pertinent to any OSD decision about extending the conversion to JP-8:

(1) perceived value of using a common fuel in CONUS and in Europe

(2) safety and technological aspects of the two fuels

(3) impact on supplies of other petroleum products

Each of these factors is addressed in the following subsections.

Value of Using a Common Fuel in CONUS and in Europe

Mixing JP-4 and JP-8 in the same fuel tanks is perceived to be a minor problem in the operation of aircraft. Additionally, aircraft that are trimmed to operate on one fuel will not operate optimally on the other fuel. A more significant problem seems to be the effect on aircraft ignition systems of shifting from one fuel to another particularly in cold weather. This is particularly true of some aircraft designed to operate on JP-4 required to operate on JP-8 in cold weather. JP-4 is a more volatile fuel and therefore does have better cold weather start-up characteristics. Once engines are running, there are no further problems. It is our understanding that only two or three types of aircraft are affected in this way and that ignition modification would be possible for these aircraft. The problems of using JP-4 or JP-8 interchangably do not appear significant.

Safety

It was pointed out in the background section of this chapter that JP-8 is a safer fuel than JP-4. Some have argued that the number of damaged aircraft which burned during the Vietnam War would have been much smaller if JP-8 had been used. JP-8 is a superior fuel in terms of safety.

Impact on Supplies of Other Petroleum Products

We have discussed in a previous section the problems of obtaining JP-4 due to the competition for that part of the barrel by requirements for unleaded gasoline. This competition for the naphtha feedstock will probably continue in the foreseeable future. At the same time, sour crudes will be gaining a larger share, thus decreasing the naphtha yield of the barrel. JP-8, on the other hand, comes from the same part of the barrel as diesel fuel

and distillate boiler fuels. It is anticipated that these demands, particularly for diesel fuel, will continue, and it should be stressed that the fraction of the barrel from which JP-8 comes is smaller than the fraction from which JP-4 is derived. The requirement to produce an additional 300,000 barrels of kerosene-based jet fuel a day would, in our opinion, place excessive strain on the requirements on that part of the barrel. Nevertheless it is probable that in the early 1980s there will be increasing supplies of natural gas liquids or natural gasoline. These will come on the market as a consequence of the expanding natural gas production encouraged by the new pricing regulations for new natural gas. Natural gas liquids are a fine feedstock for the manufacture of jet fuels yet are unsuitable for the production of unleaded gasoline. It is possible that natural gas liquids will be in surplus in the early 1980s, whereas the kerosene part of the oil barrel will remain in strong demand throughout the 1980s.

Need for Further Study

The USAF Energy Office has taken the position that CONUS Air Force aircraft should continue to use JP-4 for the foreseeable future and we agree with them. This decision should be reviewed following the completion of the conversion of NATO Air Force units to JP-8 in 1981. We suggest that a forecast be made of future availability and prices of naphtha, kerosene and liquid feedstocks for refineries, and that a quantitative cost-benefit or risk avoidance study be performed that includes the cost of accidents, modifications to engine systems, weight penalties, etc. in a comparison of JP-4 and JP-8.

A further area requiring investigation prior to a CONUS transition to JP-8 is the degree to which detrimental effects on Air Force route flexibility could ensue. The higher freeze point of JP-8 (-58°F as opposed to -72°F for JP-4) could conceivably constrain the ability of our forces to fly

over the poles. This could become a serious concern during a general limited war since diverting routes would necessarily imply longer lights and higher fuel consumption. Two additional resolutions to the freezing problem that should be studied are the costs of adding additional insulation to jet fuel tanks or using a fuel additive to decrease the freezing level. Any action, though, would depend upon the levels of impact upon readiness and flexibility.

PROCUREMENT STRATEGIES FOR DOD

The following options appear available to DoD regarding procurement issues:

- Change procurement practices for petroleum products in light of changing market conditions. This would include pricing policies, bidding procedures, and the length of contracts.
- Attract reliable suppliers from outside the United States, in particular European refiners who currently have unused capacities.
- Increase the participation of major refiners who have withdrawn from the military jet fuels market.
- Make spot market purchases of military fuels.
- Jawbone major suppliers into bidding on procurements of military jet fuels with the possible threat of reimposition of mandatory allocations.
- Request DOE to reinstate mandatory allocations on JP-4 and JP-5.

Each of these options has been evaluated in terms of the following criteria:

- impact readiness
- additional cost to DoD
- expeditious implementation
- external economic impact
- political acceptability
- long-term implications
- impact upon supplier relationships

Definitions for each of these criteria along with a summary of results of the analysis are shown in Appendix A.

Based upon the above criteria, there are a number of actions that should be undertaken. These relate to our feeling that many of the current procurement problems relate to the inability of the procurement policies to respond to the changing market conditions resulting in less coverage than deemed sufficient and therefore more uncertainty in the future. We believe this uncertainty can be reduced substantially by undertaking a study of current procurement procedures emphasizing pricing policies and bidding procedures. We believe that this study would result in a positive effect on long-term supply in addition to enhancing supplier relationships. Another important undertaking is to develop strategies for increased major refiner participation in addition to seeking and attracting reliable suppliers from outside CONUS most probably with European refineries where excess capacity now exists.

We believe these measures will help improve the supply in the long-term and also enhance supplier relationships and have a positive external economic impact in addition to having a positive impact upon readiness. Furthermore, we believe that each of these undertakings would be politically acceptable.

Investigating spot market purchases for product is another undertaking strongly recommended to enhance supply availability. Spot market purchases would be advantageous at those times when there is a temporary oversupply of crude oil resulting in a spot market price of finished product that may be lower than that price paid for petroleum supplies under long-term contract. We believe that there will be times when spot market purchases can be quite advantageous to the government. Additional advantages include expeditious implementation, positive external impact, and enhancement of supplier relationships.

There are at least two other courses of action DoD could take in securing supplies of mobility fuels in the short-term. These include jawboning major suppliers into bidding on procurements of mobility fuels and using a possible threat of requesting DOE to reinstate mandatory allocations on JP-4 and JP-5. Although each of these strategies has some advantages, there are a number of disadvantages that might cause some serious reservations about their use. The advantages are that they have a positive impact upon readiness in the short run, result in no additional cost to DoD, and can be implemented in a relatively short time.

These two actions also have some possible disadvantages which may overshadow the advantages. For instance, each action will have a very negative impact upon supplier relationships and could thus hinder long-term supply. Suppliers would feel that jawboning or reinstatement of allocations are tactics that prevent a balanced seller/buyer relationship and therefore one that creates additional pressures to terminate at some future time.

Reinstatement of mandatory allocations might also be a politically unacceptable solution to DoD's problem as far as DOE is concerned. DOE has gone on record many times and has supported efforts in the last several years to decontrol petroleum products when in the best interest of the Country to do so. Therefore reinstating controls might place them in an awkward position unless it could be shown that all other courses of action had already been exhausted. In addition, these actions would tend to lesson competition within the industry therefore having a negative economic effect. We believe therefore, that use of jawboning and reinstatement of mandatory allocations should be used after all other options have been exercised.

RECOMMENDATIONS

In summary, we believe that consideration should be given to

- Determining if current pricing policies, bidding procedures, and the length of contracts need improvement given changing market conditions.

- Examining the prospects for attracting reliable suppliers from outside the United States, in particular European refiners who currently have unused capacity.

- Investigating the reasons behind the exodus of major refiners from the military jet fuels market in order to develop strategies for increasing major refiner participation.

- Investigating possible spot market purchases of military fuels during those times when it would be advantageous to do so.

III. STOCKPILING ISSUES

In the previous chapter described DoD's current problems in procuring JP-4 and those anticipated for future procurements of JP-5. This chapter examines the domestic oil reserves to which DoD might have access in a peacetime energy emergency.

STRATEGIC PETROLEUM RESERVE

Background

The establishment of the Strategic Petroleum Reserve (SPR) is perhaps the most important result of legislation designed to lessen U.S. dependence on imported oil. At present, the goal is to store one billion barrels of petroleum by 1985. The SPR is designed to help stabilize the national and international petroleum situation by:

- reducing the economic impact of an interruption in supply
- providing credible evidence that the United States has the will to insulate its energy economy from major supply disruptions
- contributing to international stability through the International Energy Program

The plans to use the SPR will be an integral part of a larger plan to respond to national energy emergencies as well as to fulfill U.S. obligations under the emerging allocation provisions of the International Energy Program. Factors which will influence the decision to use the SPR include: the state of the economy, the duration and severity of the disruption, the potential for conservation and the availability of the SPR.

The decision on whether and how to use the SPR will be made by the President in the event of an interruption. The President must find the

existence of "severe energy supply interruption" as defined by the EPCA, before the SPR can be used.

The effectiveness of the SPR will depend on a Congressionally approved system to allocate available crude oil, residual oil, and refined products, to assure an equitable distribution of any economic hardships resulting from an interruption. Any allocation plan developed would have to be consistent with the objective contained in Section 4 of the 1973 EPAA to ensure that available petroleum is equitable distributed. Included in this section are provisions for the protection of the public health, safety and welfare, maintenance of public and agricultural services and the preservation of an economically sound and competitive petroleum industry. It is the latter provision that has been the main force behind such regulations as entitlements, the small refiner bias and mandatory allocation, as described in Chapter IV.

Current Status

Cost overruns, delays, and engineering difficulties have caused the goal of a one-billion-barrel SPR to come into question. Other figures have been mentioned, ranging from 150 million to 750 million barrels.[1] To date, there has been no administrative action to limit the size of the reserve.

The uncertainty about the ultimate size of the SPR raises some doubt as to its ability to protect the United States against an embargo and to reduce the impact of supply disruptions. Several studies have shown that for

[1]The EPCA in Section 151 that the reserve shall contain up to one billion barrels of petroleum products (defined to also include crude) but not less than 150 million barrels.

the SPR to serve these functions, its ultimate size should be in the vicinity of one billion barrels.[2]

This uncertainty also has an impact on the execution and fulfillment of the obligation the United States has under the International Energy Program. Under this program, each member country is obligated to contain in stockpiles the equivalent of 90 days of its imports. Assuming that the United States imports approximately 9 million barrels of oil per day, it should have a stockpile of around 810 million barrels of petroleum products and crude.

There is no currently approved distribution plan for drawing down the SPR. Attempts to publish such a plan have met with Congressional disapproval in the past and more recently with internal DOE departmental disagreement. A question of possible legal contraints on DoD's use of product refined from the SPR crude has been raised. The SPR counsel is of the opinion that there are no such constraints on DoD. However, any attempt on DoD's part to obtain access to the crude oil stored in the SPR would have to be part of an approved distribution plan, which does not now exist.

Inclusion of DoD in a crude oil distribution plan is still not enough to guarantee its needs. The DoD has to be asssured of having products, in particular JP-4 and JP-5, available during national emergencies. The Refinery Yield Program and the Standby Product Allocation and Price Regulations, both part of DOE's standby regulations to come into effect during national emergencies, are two ways by which DoD can acquire such products. These two regulations are addressed in detail in Chapter IV.

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[2] Recommendations for the Overall size of SPR, Memo to Myron Allen from Egon Balas, FEA, October 28, 1976.

NAVAL PETROLEUM RESERVES

One alternative to the SPR is the former Naval Petroleum Reserves (NPR), now the National Reserves. The NPR is an excellent de facto storage facility for several reasons: the crude oil is already contained in a "natural" cavern (no need for spent salt domes); the Navy has already done extensive drilling; and exploration and pipelines already exist. In addition, this form of stockpiling would not have the negative effect on the balance of payments, as would importing crude to stockpile. The only production during nonemergency situations could be just the amount necessary to keep the wells active.

The Elk Hills site is currently producting about 130,000 barrels of oil per day and has an estimated 1.2 billion barrels in recoverable reserves. The Naval Petroleum Reserves Production Act of 1976 directs DOE to develop and produce Elk Hills at the maximum efficient rate. It also requires that pipeline capacity of not less than 350,000 barrels of oil per day be secured from Elk Hills to shipping or marketing points. Part of this requirement has already been identified in private pipelines in the vicinity of Elk Hills

The most obvious negative effect on the economy would be on the many small refiners who have become dependent upon the Elk Hills crude since the Naval Petroleum Reserves Production Act of 1976. The minimum amount of crude pumping required to keep the wells active would not be enough to keep all of the refiners in business, thus forcing the small refiners to find other sources.

One of the provisions of the Naval Petroleum Reserve Production Act of 1976 provides that the NPR shall be used and operated for the "production of petroleum whenever and to the extent that the Secretary of Energy, with approval of the President, finds that such production is needed for national

defense purposes and the production is authorized by a joint resolution of Congress."

It is possible that in an emergency, production from the NPR could be earmarked by the President for DoD use. We believe that DoD should move to clarify those issues that relate to when and how production from the NPR could be used. Clarification of these issues will result in providing DoD with a secure source of supply in case of a major supply interruption.

The provisions of the Naval Petroleum Reserve Production Act of 1976 are scheduled to expire in 1985. It seems to be in DoD's best interest to seek from Congress the reassigning of the jurisdiction of the NPR to DoD. Potential NPR production can greatly cushion any petroleum supply disruption and provide for the national defense. There would also be no adverse economic effect on the petroleum industry to be attributed to DoD, since this law states that NPR production be shut down by this time: production was to proceed for three years only.

STOCKPILING STRATEGIES

There are several strategies available to DoD concerning crude oil and product stockpiles. These appear to be as follows:

1. Gaining jurisdiction over the NPR as a de facto stockpile of crude.

2. Earmarking production from the NPR for DoD use during energy emergencies.

3. Increasing the inventory capacity at those posts, camps, and stations hurt most by oil supply disruptions.

4. Providing special provisions for DoD suppliers when the national defense posture is at risk in the SPR distribution plan for the SPR.

5. Increasing inventory levels of JP-4 and JP-5 as a hedge against procurement difficulties.

The results of the analysis is shown in Appendix A.

All five options would reduce the impact of an embargo or supply shortfall and therefore have a positive effect on readiness. In addition, the first four also could increase long-term supplies.

We believe that production from the NPR is the best stockpile available to DoD at present. Clarifying when and how this production can be used is extremely important especially during severe shortfalls. There could be some negative impacts with regard to external economic impacts on small refiners and the political acceptability to DOE. Each of these considerations might be difficult to deal with in the short-term. However, we believe that DoD should pursue use of the NPR either as a de facto stockpile or at a minimum as a source of crude oil during times of peacetime emergencies.

The option of increasing inventory levels of JP-4 and JP-5 or increasing inventory capacity of those posts, camps, and stations hurt most by supply distruptions should be weighed against the additional cost incurred by DoD for both purchase of additional supplies and increased inventory costs. We believe that additional investigation is necessary before a decision can be made.

RECOMMENDATIONS

We believe that DoD should act to further investigate each of these options stated above especially gaining jurisdiction of the NPR first as a stockpiling facility and also the earmarking of production for use during peacetime energy emergencies.

IV. LEGISLATIVE/REGULATORY ISSUES

Congress will have to act on a number of controversial issues in the next two years that will significantly affect the future availability of mobility fuels. These will include proposals on gasoline decontrol, decontrol of crude oil prices, oil-related taxes, horizontal divestiture, pipeline divestiture, lockup of federal lands, and production incentives for fossil and alternative fuels. Many regulatory issues that will affect the availability of mobility fuels in the future are still not finalized. Regulations involving the DPA and the EPAA, for example, still need to be clarified with respect to application during energy emergencies. This chapter is a discussion of the legislative and regulatory issues which will affect DoD's ability to procure mobility fuels in the near future.

GASOLINE DECONTROL

DOE considers the exemption of motor gasoline from its Mandatory Petroleum Price and Allocation Regulations to be the best long-term solution to future gasoline supply problems. As an interim measure, DOE has adopted the gasoline tilt proposal, which became effective on March 5, 1979.

Gasoline deregulation and the gasoline tilt have been proposed to eliminate the impediments in the current regulations to full recovery of production costs in the prices charged for gasoline. Each proposal is designed to encourage increased investment in refining capacity and to prevent shortages, particularly of unleaded gasoline, after 1980. Deregulation would also remove restrictions on the allocation and distribution of gasoline, which hamper efficient distribution of supplies and maximum competition.[1]

[1]See Appendix B for a discussion of the factors affecting refinery investment decisions.

The current gasoline tilt regulation is intended to accomplish some but not all of the objectives of deregulation. It will improve the investment climate for expansion or modification of refineries, since it would give refiners increased flexibility to allocate costs to gasoline, and should result in increased supplies of gasoline. However, it may not provide explicitly for recovery of a return on equity investment, which may discourage some investments. It may not provide enough cost reallocation to cause investments in very high cost gasoline production capability. It will not change the inefficient distribution arrangements and anticompetitive supply and price arrangements caused by current regulations.

We believe that the gasoline tilt will not enhance DoD's ability to procure mobility fuels, especially JP-4, in the short-term. The production of unleaded gasoline will increase but not the production of other products. Gasoline deregulation, if approved in the near future, could provide the necessary investment incentives to increase new high-cost production capacities to meet the demand for both gasoline and other products. We believe that DoD should support the deregulation of gasoline.

PRODUCTION INCENTIVES

Legislation that will have an impact upon future availability of mobility fuels will deal with Government incentives to industry to develop alternative fuel sources. There are currently a number of initiatives taking place in Congress which should be supported by DoD.

The most probable legislation that DOE will introduce will be in the form of an oil shale tax credit. This bill will probably be similar to the $3/barrel tax credit that was eliminated from the National Energy Act recently passed by Congress. DOE's position is that it is important to develop incentives for industry for development of oil shale and coal and that this

tax credit will be a first step in that direction. Talks with officials at DOE indicate that they are willing to provide a mechanism written into the bill that will ensure some set-aside for DoD's use initially for R&D purposes. We believe it is important for DoD to work closely in the coming months with officials at DOE so that DoD can provide the necessary input to this proposed legislation.

In addition to an oil shale plan, Congress will encourage enhanced oil recovery by loan guarantees and price supports; will consider oil for coal gasification and liquefaction via research and development grants, loan guarantees, and price supports.

REGULATORY ISSUES

Regulations implementing energy legislation passed by Congress are generally written and enforced by the ERA, which is part of DOE.

The ERA published two final rules in January 1979 concerning standby procedures that would become effective either during a national petroleum shortage or at the discretion of the ERA Administrator. They are: the Standby Mandatory Crude Oil Allocation and Refinery Yield Control Programs, and the Standby Product Allocation and Price Regulations and Imposed Allocation Fractions. These rules were written with the aim of partially fulfilling U.S. commitments under the International Energy Agreement (IEA).[2] When in effect, the standby allocation rules would require DoD to submit petroleum requirements to DOE at least semiannually. These requirements would then be used to assign suppliers the necessary volumes of crude oil and allocated products to be provided to DoD.

[2]These provisions are listed in Federal Register, Vol. 43, February 15, 1978, page 6611.

The Standby Product Allocation and Price Regulations can be called into effect immediately if the President declares a general petroleum product shortage, or at any time by the ERA Administrator. They can be applied to any category of refined product or products. Their main purpose is to prevent significant hardships caused by crude oil or product shortages regardless of their cause. It is conceivable, therefore, that DoD could, through ERA, initiate actions towards the reimposition of mandatory controls on base-period suppliers of JP-4, for example (assuming it could prove that it had been unable to purchase its requirements of JP-4 due to a shortage).

The approval of standby regulations for the Refinery Yield Program (RYP) has given DoD a ready mechanism for obtaining petroleum products during peacetime shortages. The RYP allows ERA to "adjust the quantities of crude oil allocated among refiners in a manner designed to insure desired production levels of refined petroleum products or residual fuel oil in short supply."[3] The refiners are requird to utilize their crude supplies to ensure adequate production levels of refined petroleum levels which are, or may be, in short supply.

Clarification of how suppliers for DoD petroleum products will be identified is needed, because during emergency shortages, expeditious supply is of the utmost importance, and the use of pipelines may be warranted. Many of the refiners now supplying JP-4 are small suppliers without access to pipelines. Some of the major refiners who did supply JP-4 prior to decontrol and subsequently terminated their JP-4 refining may be prime supplier candidates in a crisis, but they may not have been allocated the necessary petroleum because of the base-period rule. This rule defines the base-period

[3]"Standby Mandatory Crude Oil Allocation and Refinery Yield Control Programs," Federal Register Part VIII, January 16, 1979.

year as "the 12-month period ending with the second full month" prior to the month an emergency is declared, or any other 12-month period the ERA Administrator considers appropriate.[4]

DoD should investigate the possibility of acquiring, through the DPA or some other mechanism, petroleum products from a refiner not otherwise obligated to supply the M, in the case of an emergency like the one described above. Clearly, neither the EPAA nor the standby allocation rules grant this authority. DoD itself proposed rules to DOE pertaining to the use of the DPA for petroleum procurement during emergencies, but to date, they have not been acted upon. It seems reasonable that some authority other than the EPAA is needed when it is in the national interest to supersede base-period relations between refiners and DoD.

Under the International Energy Program, a sufficient "triggering" mechanism could be a "general interruption of at least 7 percent of any of the participating countries' total oil consumption during a particular period". Once the mechanism was triggered, the member countries would allocate the available crude amongst themselves and begin a system of conservation, draw down of reserves and stockpiles and domestic allocation within their respective borders, thus decreasing the damaging impact on the world economy. In light of the political upheaval occuring in Iran, this level of reduction in consumption does not seem impossible even in an embargo-free environment. Yet, it is doubtful that the ERA standby regulations would be satisfactory in the event that the triggering condition were reached. It is also unlikely that the United States would be able to fulfill its obligations under the

[4] Federal Register, January 18, 1979, page 3928.

IEP's provisions,[5] one of which is to have emergency reserve stockpiles of at least 60 days of oil imports, to be increased to 90 days' worth by 1980. At present, the SPR contains the equivalent of just over 9 days of oil imports. Due to delays in the SPR Program, this amount cannot be withdrawn from storage making it unavailable for use. Chapter III deals more with the SPR.

We believe it is important for the DoD to be cognizant of legislative and regulatory issues that will affect their ability to procure future mobility fuels. DoD should develop some mechanism that allows it to survey proposed legislative/regulatory changes and prepare position papers on their effect upon DoD energy supplies. These position papers should be used as a basis for responding to public hearings that take place before legislative or regulatory proposals are enacted. We believe it important for DoD to take a more active role in making its position known on future energy issues. We believe this function should be coordinated by the Director of Energy at DoD using staff from appropriate DoD organizations as well as expertise from outside organizations such as DOE.

RECOMMENDATIONS

- DoD should take a position in support of the decontrol of gasoline.
- Develop a DoD staff function at the appropriate level to survey proposed energy legislation and regulations affecting DoD and prepare official DoD position statements.
- Work with DOE to develop the necessary regulations for applying the Defense Production Act and the Emergency Petroleum Allocation Act to petroleum products.
- Support proposed DOE legislation for enhancing oil shale technologies. Lobby for a DoD set-aside written into the bill for R&D efforts.

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[5]These provisions are listed in Federal Register, Vol. 43, February 15, 1978, page 6611.

V. PLANNING ISSUES

Three short-term initiatives could be undertaken to direct the management of future mobility fuel supplies and minimize the risks of supply disruptions. These include developemnt of a DoD Integrated Energy Plan, a DoD Integrated Research and Development Plan, and input into commercialization strategies for oil shale and coal liquids. We shall discuss each in more detail below.

DoD INTEGRATED ENERGY PLAN

DoD does not now have an integrated energy plan. Each Service prepares its own, and content and formats can vary. We believe that DoD should establish guidelines for a DoD Integrated Energy Plan to develop separate energy management strategies for fixed facilities and mobility fuel requirements.

This plan would include detailed forecasts of fuel requirements by year and fuel type and comparisons of actual usage to previous years' forecasts. It would then be possible to chart yearly progress towards meeting energy goals and to judge the accuracy of previous forecasts.

Demand forecasts should contain range values for each type of fuel instead of point values by Service, as is done now.

This change would result in a more systematic approach to determining the true dimensions of future demand for mobility fuels.

DoD INTEGRATED R&D PLAN

The transition from natural crudes to synthetic crudes made from oil shale or coal liquids and eventually to non-petroleum-derived fuels involves a research and development effort spanning 20 to 30 years. DoD must develop an Integrated R&D Plan to prepare for these transitions.

Currently, each Service prepares its own R&D plan with some guidance from DoD. For example, each Service has been tasked with certain lead responsibilities. The Navy has lead responsibility for synthetic fuels R&D. The Air Force is the lead Service for developing a multi-fuel capability that would allow aircraft to operate on both JP-4 and JP-8, as well as other hydrocarbon fuels derived from oil shale, coal, and tar sands. However, the Air Force also has a large and costly program involving alternative fuels from oil shale. Each service should have an individual program, but without overall coordination, unnecessary duplication will result. An Integrated R&D Plan will provide this coordination.

This plan is important for another reason. The DoD-DOE Memorandum of Understanding provides for DOE review of DoD's list of energy-related research, development, test, and evaluation projects to ensure that duplicate projects are not initiated. Development of an Integrated R&D Plan by DoD would lessen the chances of duplicate R&D efforts by the two agencies.

COMMERCIALIZATION STRATEGIES FOR OIL SHALE AND COAL LIQUEFACTION

DOE has been actively engaged in a commercialization effort to encourage the development of alternative domestic sources of supply so as to reduce our vulnerability to disruptions of our energy supply for either an economic or national security standpoint.

DOE's position is that it should implement as many as possible of the successful processes developed in the private sector. The objective would be to get as many technologies as possible into the marketplace. The technologies considered falling into four market categories are shown in Table V-1.

Of these technologies, DOE has selected those which they feel offer exceptional near-term opportunities. These are shown in Table V-2 along with their estimate of energy impact in 1985 and 1990.

Of the liquid fuels which are the most important from a mobility fuels point of view, only enhanced oil recovery has emerged as having any near-term impact. DOE feels, at present, that coal liquefaction and oil shale do offer potentially large sources of alternative fuels but in the mid and long terms. In both these technologies, additional research and development is needed along with additional demonstration plants to test the commercial feasibility of these technologies.

Because of the status of commercialization of oil shale and coal liquefaction, DoD is presented with an excellent opportunity by which using its mobility fuel requirements in helping to plan the commercialization strategies for these two technologies. DOE is well aware of its responsibility in the areas of national security. DoD must work with DOE to develop these strategies. This should be accomplished through the present DoD-DOE Memorandum of Understanding on cooperative projects in the energy field. The following actions are possible areas of mutual interests.

(1) Study the development of the Naval Oil Shale Reserves

(2) Incorporate DoD's R&D requirements for synthetic fuels for testing into a commercialization strategies

(3) Use DoD's future mobility requirements as a possible means of insuring a market for oil shale and coal liquefaction products.

Each of these issues will be dealt with in more detail in the upcoming report when mid- and long-term issues are discussed.

RECOMMENDATIONS

We believe that DoD should begin action to facilitate the planning process in each of the three areas discussed above.

TABLE V-1. TECHNOLOGIES CONSIDERED BY DOE FOR POTENTIAL COMMERCIALIZATION

Market Category	Technology
Liquid Fuels	Enhanced Oil Recovery
	Coal Liquefaction
	Oil Shale
Gaseous Fuels	Enhanced Gas Recovery
	Low Btu Gasification
	Medium Btu Gasification
	High Btu Gasification
Electric Markets	Utility Atmospheric Fluidized Bed Combustion
	Combined Cycle/Integrated GAsifier
	Fuel Cell Power Plant
	Hydrothermal Geothermal
	Low Head Hydropower
	Photovoltaics
	Large Wind Systems
	Small Wind Systems
Direct End Use	Urban Wastes
	Cogeneration
	Industrial Atmospheric Fluidized Bed Combustion
	Solar Hot Water
	Passive Solar Heating
	Oil-fired Heating Equipment
	High Efficiency Motors
	Air-fuel Ratio Combustion Control
	Electric and Hybrid Vehicles

TABLE V-2. SELECTED TECHNOLOGIES FOR NEAR-TERM COMMERCIALIZATION

	1985	1990
With Large Quad Potential		
Enhanced Oil Recovery	1.9-2.7 quads	3.8-5.9 quads
Unconventional Gas Recovery	1.4-1.8 "	2.7-6.2 "
Industrial AFB	.2 "	.7 "
"Ready Now" Technologies are:		
Low-Head Hydroelectric	Less than .1	.1
Passive Solar Energy	" " .1	.2
Solar Hot Water and Industrial Process Heat	" " .1	.4
Wood	" " 1.8	2.4
Conservation Product Marketing		
Oil-Fired Heating Equipment	.6	.8
High Efficiency Motora	.1	.4
Air-Fuel Ratio Combustion Control	.2	.4
Pilot Lights	.3	.6

APPENDIX A

EVALUATION OF DOD STRATEGIES FOR SHORT-TERM ISSUES

An attempt has been made to evaluate each of the options available to DoD in each of the four subject areas: procurement, stockpiling, legislative/regulatory, and planning. Each of the options that appear available to DoD are evaluated against seven valid criteria:

- Impact Upon Readiness
- Additional Cost to DoD
- Expeditious Implementation
- External Economic Impact
- Political Acceptability
- Long-Term Implications
- Supplier Relationship

The analysis attempts to show in general how each of the proposed options impacts each of the above criteria. The following definitions apply to the criteria shown in the matrix below.

- Impact Upon Readiness. Positive values indicate readiness enhancement; negative values, readiness impairment, and, zero values suggest no impact at all.
- Additional Cost to DoD. For cost, a positive value stands for no increase in cost to DoD; zero and negative values signify minimal or significant cost increases, respectively.
- Expeditious Implementation. The time frames used for the expeditious implementation are 0-3 months, 3-6 months, and over 6 months for positive, zero, and negative values, respectively.
- External Economic Impact. A negative external (the United States) economy excluding DoD) economic effect would include a worsening of the United States balance of payments, a decrease in the competitiveness of the petroleum industry, and other adverse economic impacts. Positive external impacts have the opposite effect on the economy. Zero values imply a negligible impact.

- Political Acceptability. For political acceptability, the positive, zero, and negative indicators denote, respectively, those recommendations with no foreseeable barriers, minor surmountable barriers and those viewed as unacceptable to DoD, Congress, or DOE.

- Long-Term Implications. Long-term consequences and implications indicators are positive, zero, or negative depending on whether the recommendations will definitely assure, have no effect upon, or hinder long-term supply, respectively.

- Supplier Relationship. Recommendations that could possible improve, have no effect on, or impair the relations DoD has with its petroleum product suppliers are listed, respectively, as positive, zero, or negative.

OPTIONS AVAILABLE TO DOD

	Impact Upon Readiness	Additional Cost to DoD	Expeditious Implementation	External Economic Impact	Political Acceptability	Long-term Implication	Supplier Relationship
Procurement							
1. Change procurement practices for petroleum products in light of changing market conditions. This would include pricing policies, bidding procedures, and the length of contracts	+	0	-	+	+	+	+
2. Attract reliabile suppliers from outside the United States, in particular European refiners who currently have unused capacities	+	+	0	0	0	+	+
3. Increase the participation of major refiners who have withdrawn from the military jet fuels market	+	0	0	0	+	+	+

OPTIONS AVAILABLE TO DOD
(Continued)

	Impact Upon Readiness	Additional Cost to DoD	Expeditious Implementation	External Economic Impact	Political Acceptability	Long-term Implication	Supplier Relationship
4. Make possible spot market purchases of military fuels	0	+	+	+	+	0	+
5. Jawbone major suppliers into bidding on procurements of military jet fuel with the possible threat of reimposition of mandatory allocations	+	+	+	-	0	-	-
6. Request DOE to reinstate mandatory allocations on JP-4 and JP-5	0	+	+	-	-	-	-
Stockpiling							
1. Gaining jurisdiction over the NPR as a de facto stockpile of crude oil	+	0	-	-	-	+	0
2. Earmarking production from the NPR for DoD use during peacetime energy emergencies	+	+	-	-	-	+	0

OPTIONS AVAILABLE TO DOD
(Continued)

	Impact Upon Readiness	Additional Cost to DoD	Expeditious Implementation	External Economic Impact	Political Acceptability	Long-Term Implication	Supplier Relationship
3. Increasing inventory capacity at those posts, camps, and stations hurt most by oil supply disruptions	+	-	-	0	+	0	0
4. Providing special provisions for DoD suppliers when the national defense posture is at risk in the SPR Distribution Plan	+	+	-	0	0	+	0
5. Increasing inventory levels of JP-4 and JP-5 as a hedge against future procurement difficulties	+	-	-	0	0	0	0
Legislative/Regulatory Issues							
1. Take a position in support of the decontrol of gasoline	0	0	+	+	+	+	+
2. Develop a DoD staff function at the appropriate level to survey proposed energy legislation and regulations affecting DoD and prepare official DoD position statement	0	+	+	0	+	+	0

OPTIONS AVAILABLE TO DOD
(Continued)

	Impact Upon Readiness	Additional Cost to DoD	Expeditious Implementation	External Economic Impact	Political Acceptability	Long-Term Implication	Supplier Relationship
3. Work with DOE to develop regulations for applying the DPA and the EPAA to petroleum products	0	+	-	+	-	+	+
4. Support proposed DOE legislation for enhancing oil shale technologies. Lobby for a DoD set-aside written into the bill for R&D efforts	0	+	-	+	0	+	+
Planning							
1. Begin developing a DoD Integrated Energy Plan and Energy R&D Plan	0	0	-	0	+	+	0
2. Work with DOE to develop inputs to commercialization strategies for oil shale and coal liquids	0	0	0	+	+	+	0

APPENDIX B

FACTORS AFFECTING REFINERY INVESTMENT DECISIONS

For over a decade, investments in new U.S. refining capacity particularly in grass roots construction have been declining. This decline is one reason for current product shortages and will mean increased dependence on both imported crude and imported products in the future. Although the decision to expand existing refining capacity or to invest in a new refinery is dictated by the financial, operational, and competitive situation of a particular company, there are certain industry-wide factors. They include:

- price controls
- other DOE regulations
- uncertain future gasoline demand
- excess foreign refinery capacity
- imports policy
- environmental constraints

PRICE CONTROLS

Domestic price controls represent a large subsidy to the refining sector of the industry from the producing sector. This situation would encourage new refinery investment if it were expected to be permanent. This effect, however, may be largely or wholly negated by:

1. Continuing government action to remove the subsidy be decontrol (EPCA becomes discretionary in 1979 and expires in 1981) or by proposals like the crude oil equalization tax and the fee on imported crude

2. Changes or prospective changes in the entitlements program, which reduce the value of the subsidy to particular refiners and reduce its overall advantage by allowing it to apply to refined products and non-refinery uses of crude oil

Any U.S. refiner, faced with the possible loss of this subsidy, and observing what has happened to foreign refiners without it, would probably be discouraged from refinery investment.

OTHER DOE REGULATIONS

Many DOE regulations affect refinery investment decisions. Among them are:

1. The non-product cost pass-through regulations which prevent recovery of increases in the cost of capital, including increased interest costs, and the cost of desulphurization and/or reforming units.

2. The equal application rule, which forces a refiner to spread increased costs over an entire class of customers, instead of charging them to particularly high-cost customers who may be causing the increase. For example, the increased transportation costs for supplying fuel oil to an Alaskan utility (or any remotely located customer) must be spread over all similar customers in the same PAD Districts. Therefore, if competition would prevent that additional cost from being passed through in a significant part of the given area, the refiner may find that ths option is to absorb the cost increase in preference to losing market share in that region, by raising the price. The tilt regulation eases this situation for gasoline.

3. The surplus of heavy, high sulphur crude and product on the West Coast, resulting primarily from the Alaskan crude, would normally be expected to lead to refinery modifications and to exports. However, the political uncertainty surrounding crude and product exports and exchanges, the frequent changes in entitlements treatment of California and imported crudes, and the cost recovery rules mentioned above might combine to prevent the expansion of current facilities or the building of new ones (except for small refineries).

4. The small refiner bias (SRB) is part of the entitlements program. The entitlements program is designed to equalize the crude acquisition costs of refiners having different access to low-cost (price-controlled) and higher-cost (uncontrolled) crude oil. Refiners with relatively more than the average price controlled oil have to "buy" entitlements from those with relatively less than the average; this raises the crude acquisition costs of the first group and lowers those of the second, bringing them closer to equality. The SRB allows small refiners to buy fewer entitlements than would otherwise be required, or to sell more, thus lowering their crude costs relative to larger refiners.

The SRB is large, amounting to about $1.85/bbl for the smallest refineries, those below 10,000 bbl/day in capacity (using June 1978 data). As a result, some refineries are profitable which would otherwise not be and many new small refineries are being built. DOE estimates that 114,000 b/d of new refinery capacity was added in 1977, all by 14 small refineries. Most of these are extremely simple, often consisting only of crude distillation towers and storage tanks. Such refineries produce relatively less gasoline, which is still price controlled and little or no unleaded gasoline. They specialize in residual and heating oil and JP-4 which are currently decontrolled products.

The SRB, while encouraging investment in small refineries, may discourage refinery investment overall. First, it raises the crude acquisition cost of large refiners, effectively taking from them some of the subsidy discussed earlier.

Second, it gives small refiners a competitive (lower cost) advantage in some areas, reducing the profitability of other refinery investments. Whether these effects swamp the encouragement it provides to small refinery investment is unclear.

The industry claims that the DOE regulations affect refinery investment through the uncertainty they generate -- both general uncertainty, and specific to refinery investment. The general uncertainty is exemplified by the ECOL refinery. It was built on the Gulf Coast to make a large proportion of residual fuel oil for sale on the U.S. East Coast. Changes in the entitlements program made this an unprofitable mode of operation, so it was sold to a larger company who reconfigured it to make more gasoline. The uncertainty relating directly to refinery investment is probably even more important. DOE's continuing expressions of concern about refinery capacity have led many to expect that at some time refinery investment will be subsidized. As a result, some companies might be waiting for the subsidy before undertaking expansion.

UNCERTAIN FUTURE GASOLINE DEMAND

Refiners considering capacity expansion face uncertainty about future total gasoline demand. This arises in part because the Federal automobile

mileage standards are rising, and may--along with other factors--cause gasoline consumption to peak in the early 1980's. Thus, any investment in added gasoline capacity may have very few years in which to recover costs. This would be so even with the current and DOE-forecasted shortages in unleaded gasoline. A secondary uncertainty relates to projected increased use of diesels. Diesel automobiles are able to meet environmental standards with relative ease. Their share of the market is projected to increase rapidly--possibly reaching 25% of new car sales by 1985. Any large increase in diesel sales will reduce the need for the more sophisticated refinery investment required to make gasoline, and especially large amounts of unleaded gasoline.

DEMAND FOR UNLEADED GASOLINE

The relative production of leaded and unleaded gasoline is shifting as a result of two factors--the increasing number of cars built to run on unleaded gasoline, and the EPA requirement that the average amount of lead be reduced from 2.06 gram/gallon in 1976 to 0.5 grams/gallon in October 1979. This shift required added investment. An insufficiency of such investment is a major cause for the current and forecasted future shortage of unleaded gasoline.

EXCESS FOREIGN REFINERY CAPACITY

Currently there is an excess of foreign refinery capacity. Refiners worldwide operated at only 70%[1] of capacity in 1977, and 1.6 million b/d of Europe's 21 million b/d of distillate capacity was shut down that year due to sluggish demand. Yet, worldwide capacity increased 2.25 million b/d in 1977 to 63 million b/d in noncommunist countries. Currently 3 billion b/d are under construction this year and 10 million b/d are on the drawing boards even though many of these may never be built. In the United States alone, of the

[1]All data in this section are from the Oil and Gas Journal, April 24, 1978.

10 million b/d in new construction announced from mid-1973, about 7 million b/d have been cancelled or delayed indefinitely.

World production of crude is expected to peak in the next 10-15 years. Assuming that the peak production ranges from 65-76 million b/d, the expansion in refining capacity will range from 12 million to 22 million b/d, assuming refiners operate at 90% of capacity. The likely figures would probably exceed the above, since 90% capacity utilization is never achieved by the international refinery industry. The major grass roots refineries are expected to be located in the Middle East and North Africa. In the rest of the world, the emphasis will be on expansion of existing facilties. Arab members of the OPEC are determined to process the largest possible quantities of crude they produce. The purpose is not only to upgrade exports, but to give the Arab nations technical expertise downstream. However, there is great uncertainty as to how aggressively they will push refinery construction--at least till rising demand begins to firm up prices.

Given the uncertainty associated with the future worldwide refining capacity increase and the current excess in foreign capacity, we might expect that domestic refiners would tend to wait before undertaking a major investment in refining capacity.

Foreign refiners are operating currently at 60-70% of capacity. While their crude costs probably exceed those of U.S. refiners (they pay world prices for all their crude), they may be willing to sell products in the United States at prices below that of a domestic refiner with a new refinery--that would prevent recovery of all costs, including capital costs of a new U.S. refinery. In addition, the present pass-through regulations do not allow recovery of all capital costs, but allow recovery of purchased products, which

appears to provide an incentive to import as opposed to expand to produce domestically.

POLICY IMPORTS

The U.S. refining industry has long been protected from foreign competition. In the pre-embargo period, the Mandatory Oil Import Program (MOIP), which set volumetric limits on the amount of crude and oil imports into the U.S., had the effect of insulating the price of American crude oil from lower world prices. Since the period after OPEC took over the price setting in world crude markets, a combination of price controls on domestic crude oil--the tier system--and sharing among U.S. refiners of this lower-priced crude through the entitlements program has protected the U.S. refiner from foreign competition. Currently, about 41% of the U.S. crude oil is under price controls which gave the U.S. refiner a $2 to $7/bbl price advantage over foreign competition. In addition, a surcharge of $.63/bbl is imposed on imported products (except residual fuel oil imported into PAD I). With such a strong price advantage, domestic refiners have faced relatively little competition from imported refined products. However, under existing legislation, domestic price controls are due to be phased out no later than 1981. Increases in domestic crude costs for domestic refiners might be coming sooner in the form of elimination of controls or an import tax on crude. This would turn the tide against domestic refiners, particularly on the East and Gulf Coasts, due to excees refining capacity in the Caribbean and Gulf Coast. The removal of the $.21/bbl crude import fee currently in effect will not be enough of a protection, since refiners in the Caribbean and Gulf Coast enjoy the following cost advantages:

- use of unloading facilities for supertankers
- use of foreign rather than U.S. flag ships

- lower wage and other employment costs
- minimal expenditure of capital for environmental controls
- lower operating costs
- ability to burn higher-sulphur, lower-cost crude
- exemption from income taxes and local taxes

The current movement of products from the Gulf Coast to the East Coast domestically will be lost to Caribbean refiners due to the added freight disadvantage of $.55-.75/bbl, since any shipment within the United States has to be moved by the more expensive U.S. flag vessels. The absence of a firm import policy for refined products might be postulated as one of the reasons for the hesitancy to expand domestic refining capacity.

The demand for products in the U.S. is expected to rise by about 2.2-2.4 million b/d between 1978 and 1985--an annual growth rate of 1.5%. Some of this increase in demand might be satisfied by the substantial spare capacity in the Caribbean and Gulf Coast with their lower-priced products as opposed to products from newly built domestic plants. However, if no substantial increase in domestic refinery capacity is forthcoming, this will encourage construction of new foreign capacity to meet increased domestic demand, which is clearly detrimental to the U.S. national interest in the long run. Imposition of steep import fees to encourage domestic refinery expansion might be unacceptable for consumer interests, particularly in areas accessible to lower-priced imports, such as the Caribbean or the Gulf Coast.

Tied in with this policy of restriction of imports is the political backlash such a policy would have on the OPEC exporters of curde, particularly the Saudis who plan on constructing huge refinery capacity for world exports of refined products. It is foreseeable that they might tie in the import of refined products as a precondition to the import of crude.

ENVIRONMENTAL CONSTRAINTS

In the United States, environmental constraints have increased capital investment considerably over the last few years, which has had the effect of draining capital from refinery investment. Under the Clean Air Act, refiners feel considerable uncertainty regarding fuel additives and refinery emissions. This has required refiners to run higher quality crude since EPA has recently banned MMT, which boosts octane. This has also required additional refining capacity in the form of reformers. At the same time, EPA has given waivers to approximately 76% of refiners from the lead phase-down program. This has resulted in refiners being less willing to invest in reforming capacity, in the hope that they would get waivers, since it is not clear as to how many and for how long EPA will continue to give waivers.

Additionally, conservation goals might be mandated by EPA and DPE regulations, and refiners might be required to maintain a dual fuel capability (oil and coal), or to burn coal. This has additional capital outlay through according to current DOE regulations.

Additionally, the costs of getting permits for refining, environmental controls, etc., have increased and the costs are not recoverable under capacity domestically.

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This report analyzes the current energy situation with respect to the availability of mobility fuels and presents recommended guidelines and policies that should lessen the barriers impeding fuel availability to DoD during peace time conditions. This report concentrates on current issues and recommends strategies that can be implemented immediately and are geared towards alleviating short-term problems. We have concluded that there are a number of factors that are impairing the ability of DoD to secure adequate

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supplies of mobility fuels. These factors include changes in market conditions, the lack of flexibility in procurement practices, the continued uncertainty over legislative and regulatory issues, and the decontrol of JP-4 and JP-5 jet fuels.